DOCUMENT RESUME

ED 256 867 CE 041 132

AUTHOR	Calder, Clarence R., Jr.; And Others
TITLE	Technology: The Gifted Student in the Elementary School. Monograph 11.
INSTITUTION	American Council for Elementary School Industrial Arts, Washington, D.C.
PUB DATE	84
NOTE	41p.
AVAILABLE FROM	Dr. William A. Downs, ACESIA Publications Chairperson, G108B, Central Missouri State University. Warrensburg, MO 64093 ($2.50).
PUB TYPE	Guides - Non-Classroom Use (055)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Career Exploration; Elementary Education; *Elementary School Students; Equipment; *Evaluation Criteria; Experiential Learning; *Gifted; Hand Tools; *Learning Activities; Models; Student Evaluation; *Student Projects; Talent; Technical Education; *Vocational Education
IDENTIFIERS	Enrichment Triad Model

ABSTRACT

The information presented in this monograph can give the classroom teacher insights into how technological processes enhance learning for the gifted and talented. A broad definition of giftedness includes three clusters of traits necessary for determining giftedness: above average ability, task commitment, and creativity. The monograph discusses some evaluation techniques that can be used with a high degree of accuracy to identify gifted and talented individuals in this area. The Enrichment-Triad Model was designed to assist in fulfilling two major goals of any gifted program: to provide students with an opportunity to pursue their interests in depth and to enable them to pursue their interests in their own learning style. The three types of enrichment experiences presented in this model are general exploratory activities, group training activities, and individual and small group investigations. Many technological processes/practices can be used in each phase of the Enrichment-Triad Model. Examples used in this monograph include solid block construction; frame construction; printing techniques; creative use of materials, tools and equipment; and exploration of the world of work. By being exposed to and using materials, tools, equipment, and processes like those suggested in this monograph, students can become more aware of their environment and able to cope with the demands of the society that awaits them. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED256867

Technology: the Gifted Student in the Elementary School

Monograph 11

Authors:

Dr. Clarence R. Calder, Jr.
Professor
University of Connecticut

Dr. Joseph S. Renzulli
Professor
University of Connecticut

Ms. Christine E. Calder
Research Assistant
University of Connecticut

AMERICAN COUNCIL FOR ELEMENTARY SCHOOL INDUSTRIAL ARTS

An Affiliate of
The American Industrial Arts Association

CE041132

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Eric Blankenbuhler

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ACESIA PUBLICATION COMMITTEE

1983-1984

Clarence R. Calder Jr., *Chairperson*
University of Connecticut
Storrs, Connecticut

Richard Dahl
San Francisco State University
San Francisco, California

Mark E. Frizzell
University of Connecticut
Storrs, Connecticut

Michael J. Williams
Central Connecticut State University
New Britain, Connecticut

Technology: the Gifted Student in the Elementary School

Introduction

Equality in education has received considerable emphasis in recent years. The view that each student should have his or her place in the regular classroom regardless of race, color, creed, or physical or emotional handicap is supported by both scholars and laypersons. However, there is also an awareness that individualized attention is needed in the classroom to address some of the apparent differences. This is exemplified in the case of the gifted student. For this student, the use of individualized instruction, self-paced programs, and personal investigations may be the needed formula for his or her true potential to be realized.

It is the intent of the material in this monograph to examine various definitions of giftedness, and characteristics of the gifted, as well as the gifted in relation to the teaching of technology.

Definition of Giftedness

Individuals of superior ability have always been of interest to society. The brilliant scientist, the talented athlete, the accomplished musician, and the skilled craftsman all inspire awe and admiration. Are these individuals "gifted" or do they merely possess superior ability in specific fields? What, in fact, is giftedness? Defining what it is that makes an individual "gifted" is a difficult task. Opinions vary and there exist nearly as many definitions of giftedness as there are individuals to define it.

This multitude of definitions and opinions of giftedness can be placed into some order if one visualizes them along a spectrum ranging from "liberal" to "conservative". The criteria used for judging the definitions being "the degree of restrictiveness used in determining who is eligible for special programs and services" (Renzulli, 1978). Using restrictiveness as a criterion gives a dual meaning to this word. One way restrictiveness is used refers to the area where the talent is concentrated, while the other refers to the level of achievement in a given area.

The extreme conservative definition is somewhat limited in scope. Consideration is given solely to academic areas, and the level of achievement required is extremely high. As defined by Terman (1926):

> . . . the top 1% level in general intellectual ability, as measured by the Stanford-Binet Intelligence Scale or a comparable instrument.

The liberal definition covers a much broader scope:

> There are children whose outstanding potentialities in art, in writing, or in social leadership can be recognized largely by their performance. Hence, we have recommended that the definition of giftedness be expanded and that we consider any child gifted whose performance, in a

potentially valuable line of human activity, is consistently remarkable. (Witty, 1958)

This definition shows that the liberal view considers a much wider range of areas that will include potentially gifted individuals. Also the question of the level of achievement is less stringent. However, the liberal definition is not flawless. Renzulli points this out in his article "What Makes Giftedness? Reexamining a Definition." He stated that the liberal views "open up two 'cans of worms' by introducing the values issue (What are the potentially valuable lines of human activity) and the age-old problem of subjectivity in measurement."

Renzulli goes on to say that today the values issue has been greatly resolved. Most educators have tended to shift away from standardized tests or purely academic areas in determining giftedness. However, the problem of subjectivity provides greater difficulty. As the range of areas considered increases while the dependency on standardized tests decreases simultaneously, it becomes increasingly necessary to depend on human judgement in determining giftedness. According to Renzulli (1978):

> The issue boils down to a simple and yet very important question: How much of a tradeoff are we willing to make on the objective and subjective continuum in order to allow recognition of a broader spectrum of human abilities? If some degree of subjectivity cannot be tolerated, then our definition of giftedness and the resulting programs will logically be limited to abilities that can only be measured by objective tests. In order to maintain a larger reservoir of potentially gifted individuals, objectivity in measuring giftedness must be forgone to a certain extent.

The definition leaning toward the liberal interpretation which has gained recent popularity emerged from the U.S. Office of Education (USOE) (1972):

> Gifted and talented children are those . . . who by virtue of outstanding abilities are capable of high performance. These . . . children . . . require differentiated educational programs and or services beyond those normally provided by the regular school program in order to realize their (potential) contribution to self and society.
>
> Children capable of high performance include those who have demonstrated any of the following abilities or aptitudes, singly or in combinations: 1) general intellectual ability, 2) specific academic aptitude, 3) creative or productive thinking, 4) leadership ability, 5) visual and performing arts aptitude, 6) psychomotor ability.

This definition has been used by many states and school systems for their gifted programs.

Despite this popularity, Renzulli feels that although the definition covers a wider range of performance areas than traditionally acceptable, it too has its flaws. Namely, Renzulli (1978) finds three major problems with this definition:

> The first lies in its failure to include nonintellective (motivational) factors . . . second . . . relates to the nonparallel nature of the six categories included . . . third . . . it tends to be misinterpreted and misused by practitioners.

Justification for the need to consider motivational factors in identifying the gifted is shown later in this article. As for the second problem, Renzulli states that specific academic aptitude and visual and performing arts aptitude "call attention to fields of human endeavor or general performance areas in which talents and abilities are manifested. While the remaining four categories are more nearly processes that may be brought to bear on performance areas." Finally, Renzulli finds that the third problem lies in the definition's failure to provide educators with any common set of guidelines by which to select gifted students. Often the six categories are considered mutually exclusive, hence, limiting the scope of coverage in identifying the gifted.

In addition to defining what makes an individual gifted, a related problem which has plagued experts in this field deals with identifying the gifted. What qualities do the gifted possess which place them apart from the norm? According to Renzulli, three "clusters of traits"—above average ability, task commitment, and creativity are all needed for giftedness (see Figure 1). Renzulli (1978) goes on to say:

> . . . no single cluster 'makes giftedness'. Rather, it has the interaction among the three clusters that research has shown to be the necessary ingredient for creative and productive accomplishment.

This is more clearly seen by analyzing each cluster in turn. Traditionally, such "indicators of academic success" as standardized tests have been used to place individuals in special programs. Those individuals selected usually come from the ninety-fifth or above percentile. However, recently studies have supported the conclusions of Wallach (1976):

> Above intermediate score levels academic skills assessments are found to show so little criterion validity as to be a questionable basis on which to make consequential decisions about students' futures. What the academic tests do predict are the results a person will obtain on other tests of the same kind.

Wallach has found that test scores alone are not sufficient to insure giftedness. He contends they are an inaccurate measure of future success and achievements. Research shows that often high test scores and grades (high school and college) are inconsistent with post-graduate achievements.

Reliance on tests alone will limit the selection for gifted programs to those individuals who score in the 95th percentile at least, while studies

show that these individuals may not possess the greatest ability for future success. Renzulli (1978) concludes:

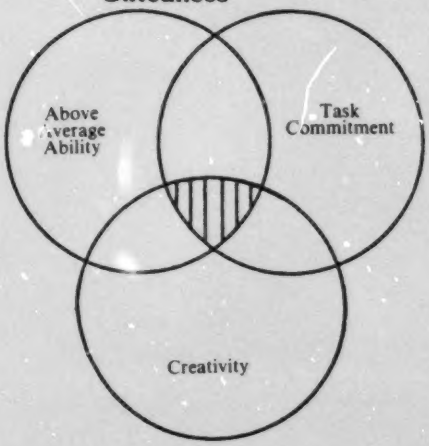
> In other words, more creative/productive persons come from below the ninety-fifth percentile than above it, and such cut-off scores are needed to determine entrance into special programs, we may be guilty of actually discriminating against persons who have the greatest potential for high levels of accomplishment.

In the quest to identify the gifted, traditional means might be more detrimental than beneficial.

The second cluster features a non-intellectual factor—task commitment. According to Renzulli "task commitment represents energy brought to bear on a particular problem (task) or specific performance area." Studies both past and present have found that given equal intelligence, individuals who are more diligent in their pursuits have greater success. This high level of task dedication, a special motivational factor that characterizes creative and productive persons, is an important characteristic in identifying giftedness. Renzulli (1978) summarizes studies on this cluster by presenting two major conclusions:

> First, academic ability (as traditionally measured by tests or grade-point averages) showed limited relationships to creative and productive accomplishment. Second, non-intellectual factors, and especially those that relate to task commitment, consistently played an important part in the cluster of traits that characterize highly productive people.

Figure 1. The Ingredients of Giftedness



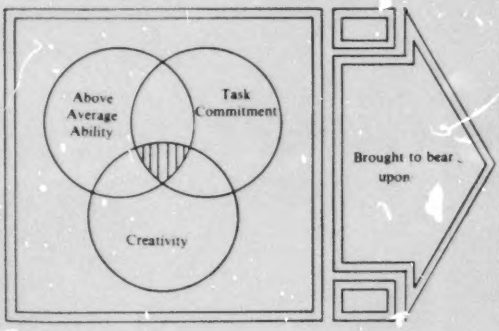
Figures 1 and 2 taken from Renzulli and Smith, An Alternative Approach to Identifying and Programming for Gifted and Talented Students. G - November/December, 1980-4.

BEST COPY AVAILABLE

Creativity is the third and final cluster of traits. In respect to this cluster, it is generally agreed that it should be included in identifying the gifted. Most experts do not question the importance of creativity as a characteristic of creative and productive individuals, however, difficulty does arise in measuring creativity objectively. Renzulli (1978) states:

> A major issue that has been raised by several investigators deals with whether or not tests of divergent thinking actually measure "true" creativity. Although some validation studies have reported limited relationships between measures of divergent thinking and creative performance criteria, the research evidence for the predictive validity of such tests has been limited. . . . Thus, although divergent thinking is indeed a characteristic of highly creative persons, caution should be exercised in the use and interpretation of tests designed to measure this capacity.

Figure 2. A Graphic Definition of Giftedness


Above Average Ability
Task Commitment
Creativity
Brought to bear upon
General Performance Areas
Mathematics, Visual Arts, Physical Sciences, Philosophy, Social Sciences, Law, Religion, Language Arts, Music, Life Sciences, Movement Arts.
Specific Performance Areas
Cartooning, Astronomy, Public Opinion Polling, Jewelry Design, Map Making, Choreography, Biography, Film Making, Statistics, Local History, Electronics, Musical Composition, Landscape Architecture, Chemistry, Demography, Microphotography, City Planning, Pollution Control, Poetry, Fashion Design, Weaving, Play Writing, Advertising, Costume Design, Meteorology, Puppetry, Marketing, Game Design, Journalism, Electronic Music, Child Care, Consumer Protection, Cooking, Ornithology, Furniture Design, Navigation, Genealogy, Sculpture, Wildlife Management, Set Design, Agricultural Research, Animal Learning, Film Criticism, Etc, Etc, Etc.

Other more objective methods for measuring creativity are needed, and in fact, have been presented:

> . . . Nicholls (1972) suggest that an analysis of creative products is preferable to the trail-based approach in making predictions about creative potential, and Wallach (1976) proposes that a student self-reports about creative accomplishments are sufficiently accurate to provide a usable source of data.

As stated earlier, there exists a need to re-evaluate the devices used for selecting the gifted. Again, the traditional means of standardized tests are seen as inconclusive measurements of the characteristics of giftedness.

Before entering into a description of the gifted in the study of technology it is important to present a few conclusions which lead to the definition of giftedness used in this monograph. A definition of giftedness should include the three clusters of traits presented earlier—above-average general ability, task commitment and creativity. Research supports the need for each cluster of traits for it is the interaction of all three which defines

giftedness. Traditionally, emphasis has been placed on superior general ability (as measured through standardized test scores) at the expense of the other two clusters. This, however, has not insured the identification of the "most able" in society.

Secondly, a useful definition of giftedness must take into consideration a broader span of performance areas than those traditionally considered. Renzulli points out "the interaction or overlap among the clusters 'make giftedness,' but giftedness does not exist in a vacuum." Rather it should be applied to specific performance areas. Any of these specific performance areas should be acceptable in a definition of giftedness, providing the area has potential value.

Finally, it must be realized that the difficulty in identifying the gifted continues after the definition is completed. Devices for this selection process must continue to be adapted to meet changing needs and characteristics of the gifted, and limits such as those imposed by traditional methods of identification must be avoided as the only criteria used for admission into special programs. Figure 2 is a graphic representation of the definition of giftedness.

Based on these three conditions, the most appropriate definition for the purpose of this monograph comes from Renzulli (1978):

> Giftedness consists of an interaction among three basic clusters of human traits—these clusters being above-average general abilities, high levels of task commitment, and high levels of creativity. Gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potentially valuable area of human performance.
>
> Children who manifest or are capable of developing an interaction among the three clusters require a wide variety of educational opportunities and services that are not ordinarily provided through regular instructional programs.

The Purpose of Technological Activities in the Elementary Classroom

The study of technology is to stimulate, enrich, and extend the learning of young children. It is not a separate subject but is considered an integral part of the total elememtary school curriculum. However, technology does possess its own individuality and makes its own unique contribution to the total education of the child. These activities in the elementary grades should be interwoven into the study of human accomplishments and how these have shaped the environment. It should encompass much more than building objects out of wood, metal, and paper. Technological activities should be a facilitator of instruction. Through its activities it becomes possible for children to study the three R's in a three dimensional perspective, for words, pictures, and ideas can be given form, detail, and color. The study of technology contributes to the

personal development of children and aids in introducing students to materials and activities to interpret the environment.

These activities may also be used to stimulate, enrich, and clarify instruction in other content areas. It serves as a cognitive link, because it provides a technique by which other subjects within the curriculum may be studied. Classroom teachers should analyze how technological activities can be used to reinforce the basic skills of reading, writing, speaking, and listening. If used wisely, these activities will enhance the learning environment and encourage the students to explore and react to the technological environment. These activities encourage children to use basic skills to seek more information related to a specific topic or activity. They also provide first-hand experiences in acquiring those skills necessary for effective living in the home, school, and community.

The gifted learner who participates in any elementary industrial arts program should possess above average general ability, task commitment, and creativity. In turn, any technological activities program for the gifted needs to play a role in the enrichment and development of these traits. The uniqueness of technological activities lies in the fact that they enhance the development of a learner's curiosity to explore the world of technology.

The Need for Each Cluster Trait in a Technological Program

Above Average General Ability

The student of less than above average ability may perform certain activities with a degree of proficiency; in contrast, the gifted should possess above average general ability in both cognitive and psychomotor skills. Many students can produce (specific types of activities) at an above average level by merely following directions. However, the gifted student can perform with a high degree of proficiency on an unusual activity and or assignment because he or she understands the hows and whys of the process required to do the activity. This individual must also have the potential to be physically skilled in the use of tools and machines, as well as understanding the properties and characteristics of various materials.

Standardized intelligence, achievement and aptitude tests are designed to judge an individual's learning potential in traditional classroom learning situations. However, these tests have little, if any, value in judging the interaction between the cognitive and psychomotor skills required to perform various technological activities. Judgement on above-average ability in elementary industrial arts must, therefore, be left to professionals capable of making these decisions.

Creativity

The content within the study of technology provides an excellent opportunity for students to be creative, because it utilizes materials, tools and experiences which enable students to explore their environment. It also presents them with opportunities to realize and interpret the environment as it is, so that they will be better prepared to shape their own environment in the future. The utilization of materials and tools, and involvement in processes and projects, environmental thinking, organizing, acting and

evaluating are vital elements in the study of technology. A comprehension of technology and its effects is necessary for developing an individual's capability to adapt to change, make decisions, implement plans and solve problems.

The study of technology can provide a wealth of material, equipment and tools and provides the student with the freedom to discover how to combine and utilize these in the solution of a problem. For the gifted student, individual ideas enter into the planning process. In seeking to understand a social problem or to create a design, students can give full play to new ideas for utilizing the materials, equipment and tools to serve their purpose. Divergent thinking has a vital place, for no set patterns have to be followed except as agreed on by the teacher and student concerned. Different approaches to problem solving are encouraged, and the lack of rigid structuring by the teacher gives latitude to the student's ideas.

Task Commitment

Commitment is an important ingredient for any student participating in a technological activities program. Drafting plans, assembling materials and using machinery and tools all require patient, careful work. Therefore, the gifted student must possess a high level of task commitment. A high degree of perseverance and dedication is needed to insure the successful completion of an activity. A piece of wood may be twisted or warped requiring additional preparation before it can be used. The student must be tenacious when meeting frustrations such as broken saw blades, ill fitting parts, or poor materials. Exuberance lost early in the project is a flaw found in less perserverent students.

Some tasks may require that projects be completely dismantled a number of times before the desired effect is obtained. Putting pieces together or making two members of a joint fit properly requires a great deal of commitment on the part of an individual. Too many students lower their working standards because they are frustrated, especially when extended time periods are required to do a quality job.

Identifying the Gifted in a Technological Activities Program

The traditional "test taking" methods of identifying giftedness are not applicable in the study of technology. There exists no standardized test for measuring capability in this area. Although IQ tests and creativity tests can be used as measures of general ability and creativity, both necessary for giftedness in a technological activities program, it has already been shown that these test are inconclusive and often incompatible with post graduate success. Hence, the identification of giftedness in technological activities must rely greatly on human judgement.

Although this may seem to be a less objective form of identification than the traditional methods used to identify the academically gifted, the authors of this monograph feel that, given the present state of the art of testing, it is the best alternative. If sound criteria are used by educators in making their judgements, this method can be used with some degree of confidence to identify those individuals with giftedness in industrial arts.

For the young child the job of identifying signs of giftedness in the area of technology is the responsibility of both parents and teachers. Signals might be given in such activities as playing with building blocks. The child possessing a fascination for shapes and their different combinations might use these shapes to demonstrate creative and unique designs. Task commitment might show through the child's determination to build a difficult structure. For the less able child this difficult structure would probably be abandoned for a less complex task. However, the gifted child will continue working on the project until its successful completion. It is important to note that even if the child appears to have stopped working on the specific structure, often he or she is continuing construction mentally.

Other signals of exceptional ability in the very young might arise from the use of such children's toys as Tinker Toys, Lincoln Logs, or Lego Blocks. The gifted youngster should be capable of branching off from patterns included in directions and creating his or her own designs and structures. Again, task commitment can be identified by the youngsters' determination in completing a particular design.

These are signals to which both parents and elementary teachers should be alert. The child demonstrating a strong interest in tools and working with his or her hands should be encouraged in these interests as soon as they are recognized.

For the older child the signals become stronger. Above average general ability, creativity, and task commitment should be easily identified by the classroom teacher. If these traits are geared toward such activities as drawing, designing, constructing or using tools, it is most probable that the child is gifted in technological activities.

If the student is to have a true understanding of tools, knowing not only their uses but how they work is important. The student who realizes that the saw cuts when it is pushed forward and not when pulled back has this exceptional understanding.

A student's creative process is also a sign which should alert the classroom teacher. Inquiry is a creative process which is commonly found in the gifted.

A student often encounters something that puzzles him or something that does not fit his or her picture of what the world is like. For example, the question, "Why does a balancing clown stand up?" arises. The student wants to know why the clown balances. The process of inquiry has begun. Using the teacher as a resource person, he or she discovers that directions for making a balancing clown and the needed materials are readily available. He or she constructs his clown with movable weights as directed. The student then experiments with the weights and observes their effect on balance. Questions are then asked about the cause of the various positions of the clown as the weights are adjusted. Conclusions are drawn as the experiments are conducted. He or she eliminates possible solutions, such as leverage, and comes to the conclusion that a properly located center of gravity is the answer. When the weights are arranged equally on both arms, he or she realizes the center of gravity has been placed in the correct

position. Thus, inquiry has been a quest for understanding and has led one student to construct a testing device that provided a solution to his or her problem. Further research into the force of gravity might be the next step in the learning process. For the less able student building the clown is satisfying, but the exceptional student wants to know the "hows" and "whys". Educators should encourage these activities by selecting the gifted and talented youngsters for special programs.

The Enrichment-Triad Model

The Enrichment-Triad Model was designed to assist in the fulfillment of two major goals of any gifted program. The first is to provide students with an opportunity to pursue their interests in depth, while the second enables the individual student to pursue this interest in his or her own learning style.

This model operates under the assumption that the role of the teacher in any program for the gifted should be to provide each student with assistance in:

1. identifying and structuring realistic solvable problems that are consistent with the student's interests.
2. acquiring the methodological resources and investigative skills necessary for solving these particular problems.
3. finding appropriate outlets to display or present products.

The three types of enrichment activities and experiences in the model are described as follows:

Type I: General Exploratory Activities to Stimulate Interest in Specific Subject Areas

Experiences and activities included under this heading are those that are designed to foster topics or areas of study in which the learner has a sincere interest. The teacher's role is to provide a classroom atmosphere with a number of attention-getting stimuli and to act as a facilitator for the learner.

Visitations and the use of guest speakers are appropriate at this level provided students are not regulated to a strictly observational role. These experiences would enable enthusiastic, creative professionals to influence the development of significant student interests and for students to delve into the actual working of various procedures in the professional or scientific world.

It is important to emphasize that at this interest-generating level of enrichment students are free to choose, explore, and experiment without the threat of having to prepare a report or provide any sort of formal recapitulation. However, these types of open activities must have purposeful objectives in assisting students to make decisions about areas of further study. During this exploratory experience the teacher has an opportunity to make subjective observations and assessment of characteristics that may indicate creative-productive potential.

Students who show an unusual intesest in a particular Type I experience should be given the opportunity to select and follow through on

a specific topic or sub-topic. It is important to note that not every student will want to or should follow up on a particular experience or activity at this level.

Type II: Group Training Activities to Develop Processes Related to the Area of Interest Developed Through Type I Experiences

Experiences and activities included under this heading are those that are designed as training exercises and are considered preparatory for students to move to Type III enrichment activity. At this level the student deals with the processes or operations that will enable him or her to deal more effectively with content.

Type II enrichment should emphasize:

1. Thinking and feeling processes such as:
   a. critical thinking
   b. problem solving
   c. reflective thinking
   d. inquiry training
   e. divergent thinking
   f. sensitivity training
   g. awareness development
   h. creative thinking
   i. productive thinking
2. How-to skills such as:
   a. using tools, equipment and materials
   b. using library systems to facilitate research
   c. classification experiences
   d. simple computer utilization
   e. simple fabrication techniques

Types I and II enrichment are considered appropriate for the majority of students and serve as the preparation for Type III enrichment. Type III is the only level considered suitable mainly for the gifted student.

Type III: Individual and Small-Group Investigations of Real Problems

The Enrichment Triad Model is predicated on the belief that giftedness will become evident in certain students as a result of their desire to go beyond Type I and II experiences. The gifted students will be those individuals who have a desire to engage in more complex, self-initiated investigative activities. The major thrust of Type III experiences is that students become problem finders as well as problem solvers and that in the process they investigate real problems.

One of the main characteristics of a Type III experience is impact on an audience. The teacher, therefore, needs to assist students in the identification of relevant audiences and techniques for bringing their work to bear on such audiences. For example, if a student constructed a robot the teacher might encourage him or her to contact the editor of a local newspaper or the manager of a local radio station, TV station or shopping mall.

Peer tutoring is a good example of a Type III activity that can be used when students have developed specific interests, manipulative skills

and creative techniques. Students with these unusual interests in technology and the ability to use this information and skill can become group leaders in a specific acitiviy. A good example would be the construction of an object using jigs and fixtures. The gifted student could design the jigs and fixtures necessary to construct a specific object.

Gifted students who experience Type I and II activities but who are excluded from Type III activities are akin to a youngster who continually practices a sport activity, but never has an opportunity to play or perform in a game or tournament. It is important to remember that the purpose of a Type III experience is to help students realize the differnece between structured exercises and real problems.

The relationship among the three types that form a total enrichment model is shown in Figure 3.

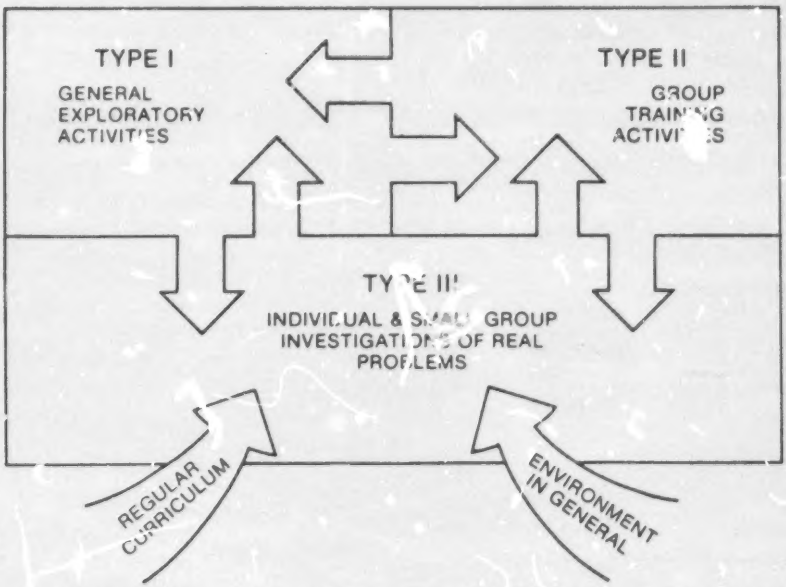


Figure 3. The enrichment triad model. (Reproduced with permission from Renzulli, J.S., The Enrichment Triad Model. Marsfield Center, Connecticut: Creative Learning Press, 1977, p. 14.)

Solid Block Construction

Solid Block Construction is an activity which can be used in each phase of the Enrichment Triad Model. This technique allows children to recreate buildings, vehicles, or other objects from the actual structure or from a picture found on a postcard or in a book. Children can construct these model objects by actually measuring the original structure and then scaling these measurements to fit a specific table top, or, they can develop their scale from a small illustration. (See page 15 for directions for making solid block models.)

Building any model from solid block construction requires extensive use of the ruler for measuring. It also requires a realistic use of many mathematical concepts, notably ratios and proportions.

Type I Enrichment

In studying American or world history and geography, models of villages of the past and other countries can help children understand different ways of living, as well as, environmental effects on people's housing. Figure 4 is an example of how different types of dwellings can be used to probe economic and cultural influences. As a Type I activity, solid block construction serves as a stimulus for exploration into the causes of structural and material differences in building design. In order to recreate a village, the student must research the design and the material used in the buildings. Through this research, students can find answers to questions such as:

1. Why are the buildings in different parts of the world built out of such different materials?
2. Why is the architecture so varied in different parts of the world?
3. What kinds of things influence the style of architecture in different countries?
4. Why don't many modern buildings have the detail and ornate sculpture of buildings built long ago?

In the early planning stages, the teacher should consider the following techniques to stimulate interest in the world of construction:

1. Slides, films, photographs and actual models of sample structures and construction projects.
2. On site visits to construction projects, historical areas or buildings and museums.
3. Guest speakers.
4. *The World of Construction* published by McKnight and McKnight Publishing Co., Bloomington, Illinois, 1982.

This exploration period can, in turn, stimulate interest in a specific country's architecture, architectural time period and design. The student can pursue this interest by creating a model of the area which he finds most intriguing.

Although students work individually on their structures, they can exchange ideas and the use of various materials. Construction consists of:

1. Scaling
2. Measuring
3. Visualizing
4. Working with
   a. tools
   b. materials
   c. equipment
5. Conceptualizing
6. Generalizing
7. Synthesizing
8. Problem Solving

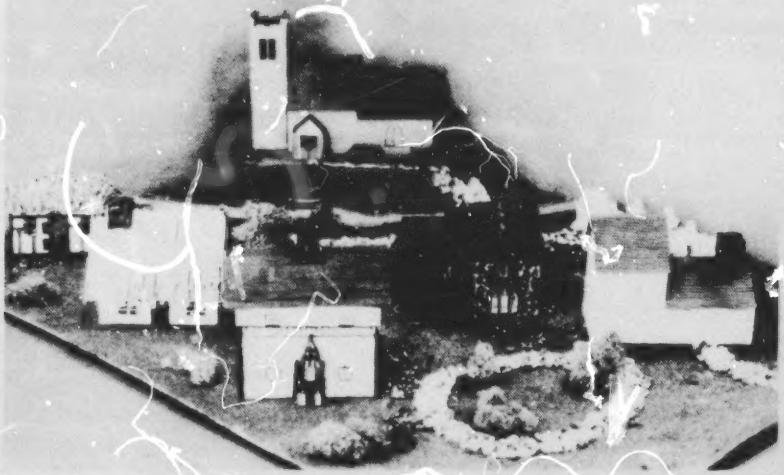


Figure 4. Homes around the world use a variety of different building materials.

Type II Enrichment

It should be pointed out that psychologists agree that it is important for children to have experiences with objects and materials instead of just reading or hearing about them. The importance of providing children with the opportunity to work in group activites that free them from their egocentrism and allow them to interact should also be stressed in any program for the gifted. The building stage of solid block construction can be used as a group training project which fulfills both of these needs.

Steps for Constructing a Model

1. Locate an illustration of the model to be constructed or designed.
2. Determine the approximate size and proportions of the structure or object to be constructed. The size is determined by using a common measurement in the illustration. For example, the height of one story is usually equal to 8'. One story on a ranch house would be the distance between the foundation and a point where the roof meets the side walls. On a large office building it would be the distance between floors. If the distance between the foundation and the point where the roof meets the side wall measures ½ inch on the structure in the illustration then ½ inch equals 8 feet.
   Next measure the length of the structure. If this distance measures three inches, the estimated length of the structure would be approximately 48 feet. (Each ½ inch is equal to 8 feet and there are 6 - ½ inches in three inches.) Now take a measurement of the width of the structure. If this distance measures one inch, the estimated width of the structure would be approximately 16 feet. (Remember each ½ inch is equal to 8 feet and there are 2 - ½ inches in one inch.)
3. Plan the size of your model. Next see how these measurements (48' length, 16' width and 8' height) are used to plan the size of your model. A piece of 2 x 4 lumber can be used for the base of the structure. The actual size of a 2 x 4 is 1 - 5/8" x 3 - 5/8", but for our use we say that it is equal to 2 inches by 4 inches. These measurements will make it easier to construct the structure.
   If 2" equals 8' it is possible to determine the size of the model. The actual structure is 8 feet high. The height of our model would be 2 inches. (8 plus 8 equals 1 x 2" equals 2.)
   The length of the structure is 48 feet. The length of the model would be 12 inches long. (48 plus 8 equals 6 x 2" equals 12.) And if the width of the structure is 16 feet, the width of the model would be 4 inches (16 plus 8 equals 2 x 2" equals 4").
   All that is required to construct the base of our model is to cut a piece of 2 x 4 - 12 inches long. Remember, the model is 2" high, 4" wide and 12" long.
4. To obtain different shapes:
   Pieces of wood 2 x 4, 2 x 6, 2 x 8, 1 x 2, 1 x 3, 1 x 4, 1 x 8, 4 x 4 or any other size available can be arranged to obtain the desired shape of the structure to be constructed.

5. Gable ends for the structure:
   Roof shapes can be obtained by cutting the needed shape from a piece of one inch pine or ½ inch plywood. Gables can be triangular, half round or any combination of shapes needed to make your model look like the actual structure.
6. Assembling the gable ends:
   Apply glue to the surface of the gable that is to be placed against the base block. Place the gable on the base block in its appropriate position on the base. Move the gable end back and forth over the base block a few times to force the glue into the pores of wood. With the gables in the appropriate position set aside to dry.
7. Irregular shaped models:
   Models of trucks, trains, automobiles and ships that require unusual shapes are constructed by using a hand saw, coping saw and Surform file.
   The hand saw and or coping saw is used to rough out the pieces and the Surform file is used to round off these cuts to the necessary contours. The Surform file also can be used to change a square piece of wood to any given shape without any previous cutting with a saw.
8. Decorating the structure:
   A wide variety of materials can be used to obtain the desired finished effect. Straw or woodchips can be used for the roof. Scrap pieces of wood, small stones for the chimney, construction paper or cardboard with the necessary features drawn on with a felt marker may be used for the side.

Type III Enrichment

For some individuals, researching, planning and building models are not enough. At this level, the student becomes a "problem finder as well as a problem solver" (Renzulli and Ridge, 1981). Model building can facilitate this desire to find a problem and its solution.

An example of this type of activity was a project undertaken by students in a gifted program in Mansfield, Connecticut. The students undertook an activity to coincide with the country's observance of the bicentennial. The project was constructing a model of how their town looked in 1776. Students used the following resources to collect information about their town:

1. Town's historical association - interviewed members and reviewed documents
2. Town's historical district - visitations
3. Town library - reviewed documents
4. Town office building - reviewed documents and old maps
5. Town residents - individuals knowledgeable about the history of the town

Collected data and information were analyzed by students and a plan of action developed. It was decided by the group that each student would select a structure to construct. Students were then given the responsibility

for obtaining additional information about their specific structure. This information was obtained by:

1. actual visits to a specific section of town for a first hand observation of a structure
2. documents at the town hall and or library.
3. photographs, line drawings and painting which were available from the local historical association.

Upon the completion of their structure, students worked as a team to create a base. The base shown here reflects the topograpy of the town in 1776. The culminating activity was a display of the finished project at a local shopping mall as a part of the town's bicentennial celebration. Obtaining permission and planning the display provides students with an additional experience consistent with the triad model.

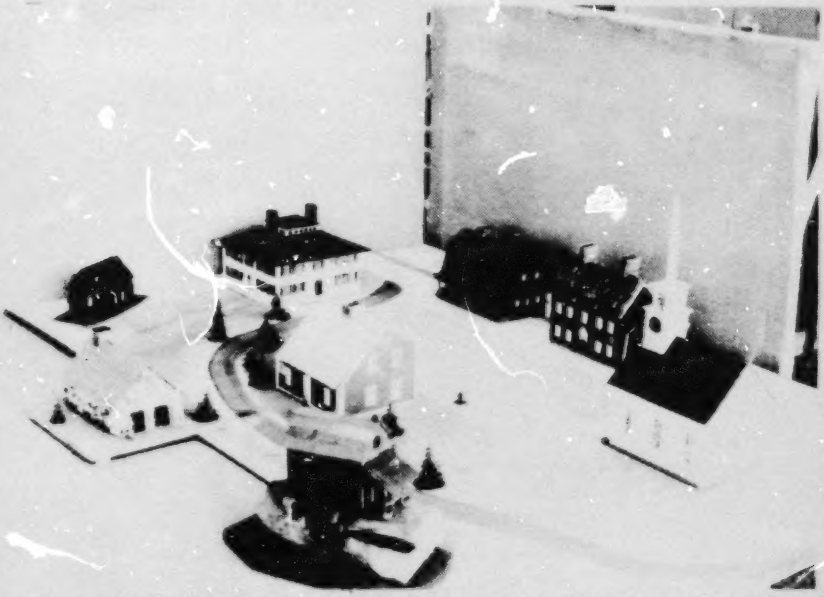


Figure 5. Solid Block Model-early New England village constructed by students in a gifted program. Mansfield Public Schools, Mansfield, Connecticut.

A second Type III Enrichment experience can be illustrated by an activity conducted by Michael Erikson, a ten year old student in Project REACH, Hudson Local School District, Hudson, Ohio, under the supervision of Joan Maher. Mike, while a fourth grader, planned and designed an addition to his parent's home that won the approval from the Architectural Board of Review. The home is located in the Historic District where the most stringent aesthetic requirements must be met to win the board's approval.

Designing the addition was actually Michael's second choice for an independent study project in the REACH program; his first consideration

was drawing cartoons. However, he thought illustrating comic strips might be too hard, so he decided to switch to architecture.

To accomplish this task Mike had to learn to draw blueprints and to use a scale, triangles and T-squares. He obtained these competencies from his mentor, Bill Boyer, who owns an architectural firm. It is interesting to note that after a short period of time Mike lost enthusiasm and began drawing cartoons of jet planes. However, once he began constructing a model of his house, the cartoons and the boredom vanished simultaneously. The extraordinary part of this illustration is that once Mike got interested in building a model he stayed with the project to the very end.

The culmination of this activity is that the remodeled house, built precisely to scale, is being replicated full size, and Michael is helping to oversee the project. This example illustrates how the Mentor Program can be of great aid to students. Such a program allows students to work with professionals in a variety of fields. In some instances, students could be provided office space in which to work.

Frame Construction

Frame construction is the process of building hollow structures using wood strapping and gusset plates (see Figure 6). Because this process requires inexpensive materials and a limited number of tools it is practical for use in schools. Furthermore, frame construction is extremely versatile, allowing the student to make a variety of large, sturdy items quickly. Some of these structures which can be made using this technique include: greenhouses, puppet stages, stage scenery, game and work tables, and animal cages.

Type I Enrichment

As a Type I activity, the student should have an opportunity to explore the process of frame construction. The learner could take two or more miniature frames and manipulate these to create different-shaped structures. This exploration experience provides the student with an opportunity to gain a feeling for the medium. After the student becomes acquainted with the medium, he can begin to design his own structure.

In addition, at the Type I level, frame construction introduces the student to the world of construction. This simple process provides the learner with a basic understanding of how more complex structures are planned, designed and built. Therefore, a general exploration into the techniques of frame construction could stimulate the gifted learner to focus his interest on such areas as engineering, architecture, and other related fields.

Type II Enrichment

In the Type II phase, frame construction can be used as a group activity, allowing students to work together in planning, designing and building a structure or scenery for a play.

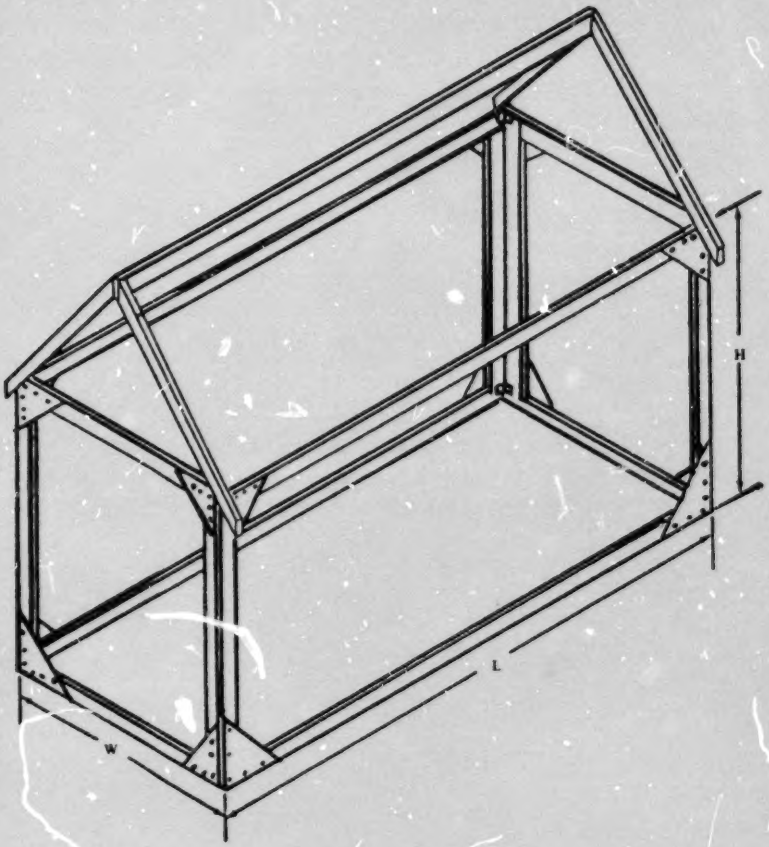


Figure 6. Framework for basic buildings.

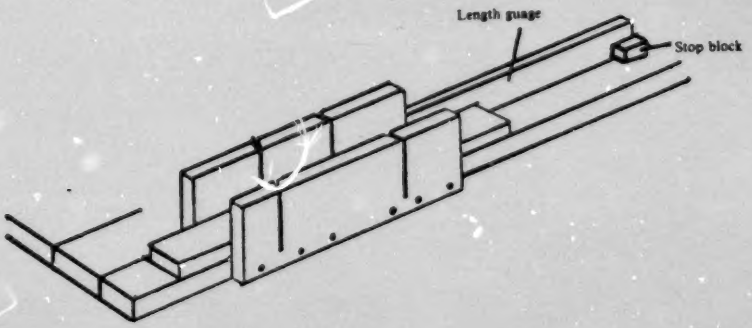


Figure 7. Length guage used with a miter box.

Frame Construction Procedures:

1. Prepare Stock for Frames

a. Make a sketch or working drawing of the object to be made, showing the necessary dimensions.

b. Determine the size of the over-all framework to be constructed, represented by the length, width and height of the structure, as shown in Figure 6. Then determine the size of each individual frame. Actual size drawings of each frame can be made on wrapping paper. The drawings can be used to check the accuracy of the strapping as it is cut to length.

c. Select a piece of strapping that is adequate for the length of the structure. With a miter box cut one end square. Be sure to hold the stock securely against the back of the box. Measure and mark the desired length on the piece of strapping. Start the measurement from the end that has just been cut square. Place the strapping in a miter box and cut to the line. Start cutting as close to the outside of the line as possible. If you have an actual size layout for the frame, check the cut stock with it.

d. Repeat the preceding operations for every additional piece of strapping that is needed. If the pieces are of different lengths, measure and mark each piece separetely. If all pieces are of one size, clamp a length gauge on the miter box. (A length gauge is a block of wood used as a stop, fastened at a distance from the saw blade that is the exact length of the piece to be cut.) Figure 7 illustrates how the length gauge is attached to the miter box.

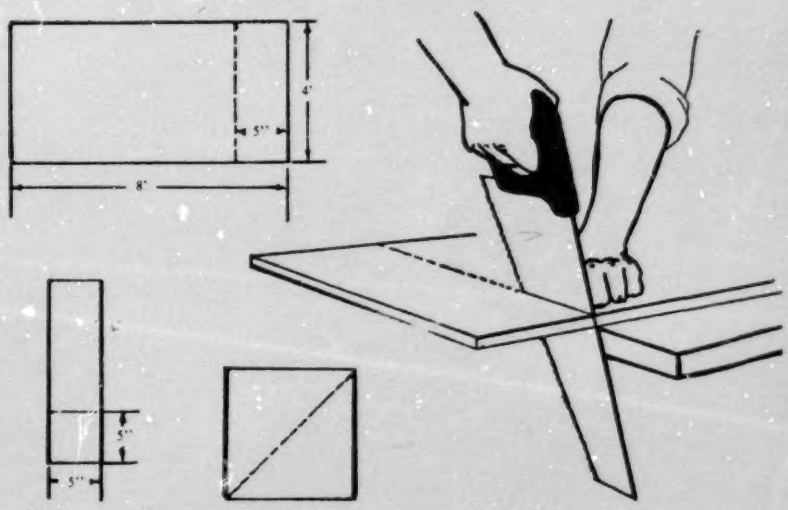


Figure 8. Procedure for cutting gusset plates.

23

2. Prepare Gusset Plates: Gusset plates, recommended for their case of construction and strength, can be made from Upson board, Masonite, or plywood. Upson board is preferred because it is the least expensive and the easiest to cut, drive nails into, and take apart. Upson board comes in large sheets (4 X 8 feet) and can be procured from any lumberyard.
   a. Select a piece of Upson board.
   b. Measure and lay out a 5-inch strip using a ruler and pencil, as shown in Figure 8.
   c. Measure and lay out a 5-inch square. Select a crosscut saw and cut out the square as shown in Figure 8. Be careful not to tear the material.
   d. Lay out the gusset plate by drawing a diagonal in the square as shown in Figure 8. This divides the square into two right triangles approximately 5 X 5 X 7 inches. Each of these triangles will form a gusset plate.
   e. Cut the diagonal after securing the square in a vise or clamp on a bench with a handscrew. Saw on the line with a crosscut saw.
   f. Repeat the preceding operations for every additional gusset plate.
3. Fasten Frame With Gusset Plates:
   a. Lay out the required rectangles, using four pieces of strapping that have already been cut to the desired lengths. Arrange them on

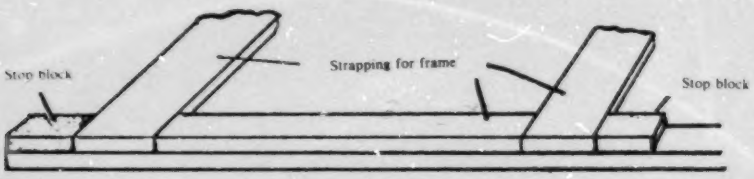


Figure 9. A clamping jig for holding frames in position while securing them.

the floor the way they should be fastened together.
   b. Using a clamping jig, clamp the pieces securely in the shape desired. Test with a square and make certain that each corner is a 90 degree angle. Figure 9 illustrates a clamping jig.

Clamping jig: A simple clamping jig can be made to assist in nailing frames together.

(1) Select a piece of strapping that is at least one foot longer than the width of the frame to be nailed together.
(2) Cut two additional pieces of strapping 6 inches in length.
(3) Apply glue to one of the wide surfaces of one 6-inch piece of stock. Place this piece of stock onto the wide surface of the longer piece of strapping so that the ends are flush. With 1½-inch, No. 16 wire brads, nail the pieces together.
(4) The second piece can be nailed onto the same surface the desired length from the first block. The length is determined by the size of

the frame being constructed. For example, if the frame is 24 inches wide, the distance between the first 6-inch block and the second block will be 24 inches. The distance does not have to be exact, because any extra space can be taken up by using a house shingle as a wedge.

(5) An adjustable jig can be made by attaching the second 6-inch block so that it is moveable. This requires drilling holes about one inch apart through both the base piece and the 6-inch piece of strapping. A nut and bolt can be used to fasten these pieces together. The opening between blocks can be adjusted by removing the nut and the bolt, moving the block to a new position, inserting the bolt, and tightening it with the nut to lock the block in place.

c. Place a gusset plate over each corner. Be sure the edges of the gusset plate are even or flush with the outside edges of the strapping.

d. Nail the gusset plates in position with ¾-inch, No. 16 wire nails. The nails should be driven about three-quarters of an inch away from the edge of the strapping. The nails should be staggered slightly. If they are in one straight line, they are apt to split the strapping.

e. Repeat the preceding operations for every additional frame.

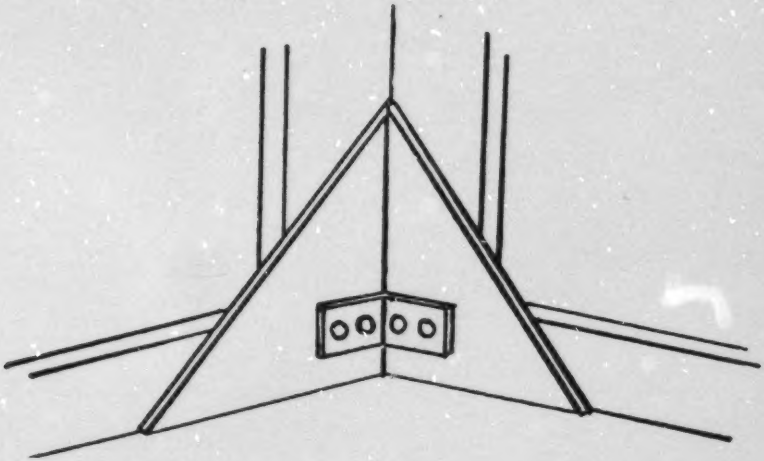


Figure 10. Using corner braces to join two frames.

4. Assemble Frames:

a. Arrange the frames in proper relationship to one another. The frames are arranged with the gusset plates facing in.

b. Lay out and mark the locations for the corner braces. Corner braces are used on the inside of the frames to fasten them. Figure 10 illustrates the location of the corner braces. There are two braces in each corner, one at the top, and one at the bottom, located

approximately in the center of the strapping. The corner braces are used for 90 degree angles. If any other angle is desired, the braces can be shaped by clamping them in a vise and bending them to the desired angle.

c. Locate and mark the center of the screw holes with an awl or nail.

d. Select a hand drill and a one-sixteenth inch twist drill and drill the required holes ¼-inch in depth. Use ¾-inch flat head wood screws to secure the corner braces.

e. Select a screwdriver with a blade tip that is about equal in size to the slot of the screw. Try to drive the screws straight and flush with or slightly below the surface of the corner brace, which has been countersunk for this purpose.

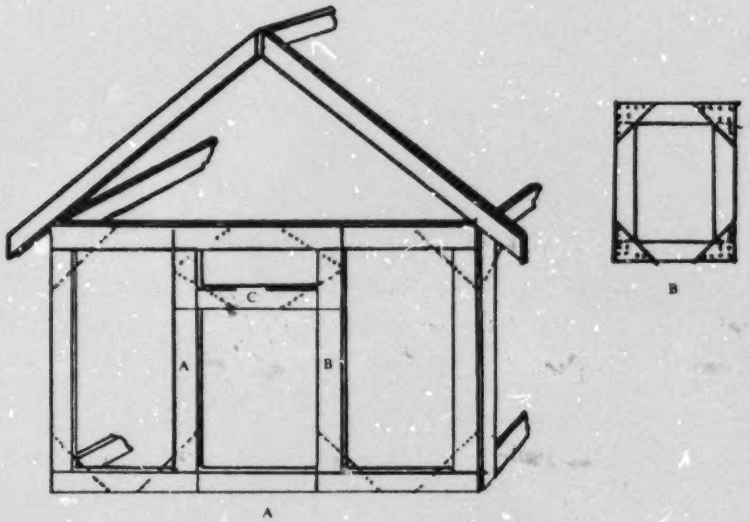


Figure 11. Door (B) will be secured to the frame in house (A).

Variations in Frame Construction Techniques

1. Door Construction: Doors are constructed using the same procedures described for building a frame. Figure 11 (B) illustrates the door for the house in Figure 11 (A).

   a. Select two pieces of strapping for the door supports A and B.

   b. Secure these supports to the frame selected to have the opening for the door. Gusset plates are used to secure the door supports to the frame as shown in Figure 11 (A). Notice the position of the gusset plates in the drawing. This position is planned to prevent interference with the opening of the door.

   c. Select a piece of stapping, C, that will fit between the door supports. Support C is used to establish the door opening, as shown in Figure 11 (A).

d. The door is hinged to support A with 2-inch butt hinges.
e. The door should be covered with the same material as the rest of the structure.

2. Window Construction: Windows can be added to any structure by adding openings to the original frames.
   a. Select two pieces of strapping, A and B, that are the height of the frames in which the windows will be placed, as shown in Figure 12.
   b. Secure supports A and B to the frame using gusset plates and wire nails. Notice the position of the gusset plates in Figure 12. This position is used to prevent interference with the window opening.
   c. Select two pieces of strapping, C and D, that will fit between supports A and B, as shown in Figure 12.
   d. Secure the supports C and D to the supports A and B with gusset plates and wire nails. Remember that the position of the gusset plates is important.
   e. Shutters and other window decorations can be added to the structure.
3. Segment Constructions: The desired structure can be some shape other than square or rectangular. It can be round or oval, for a lighthouse or a silo. The laying out of patterns for cylindrical shapes on a flat surface will be a practical application of figuring the circumference from the diameter. It will illustrate as well the relationships of the other dimensions of the cylinder.
   a. Lay out the desired shape full size on a piece of wrapping paper.
   b. Mark off the shape into segments as shown in Figure 13.
   c. Select a piece of strapping long enough for each laid out segment, as shown in Figure 13. Mark each piece of strapping individually with a pencil and an sliding T bevel to assure the proper angle as shown in Figure 14 (A). Cut the proper angle with a miter box and handsaw.
   d. Cut pieces of Upson board into 2-inch widths. The strips are then cut into 4-inch lengths. These strips are used to secure the pieces of strapping (segments) together as shown in Figure 14 (B).
   e. The segments are covered with cardboard to gain the desired shape of a circle or oval.
   f. Upright pieces can be added to the segment base with corner braces, as shown in Figure 14 (C).

Finishing

1. Select the Appropriate Material to Cover the Frames:
   a. Cardboard from large cartons can be used to cover a store, barn, post office, or house.
   b. Burlap can be used to cover a puppet stage or a tent.
   c. Unbleached muslin can be used for scenery.
   d. Chicken wire or hardware cloth can be used for cages.
2. Color and Add Detail:
   a. Cardboard can be painted with tempra paints and then shellacked to protect the painted surface.

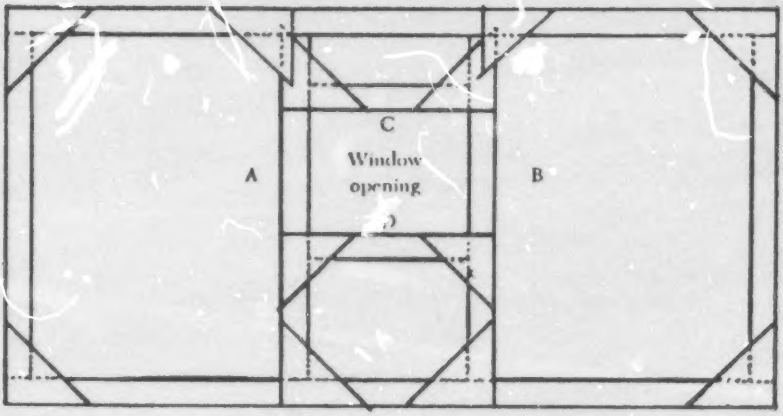


Figure 12. Layout for the window opening.

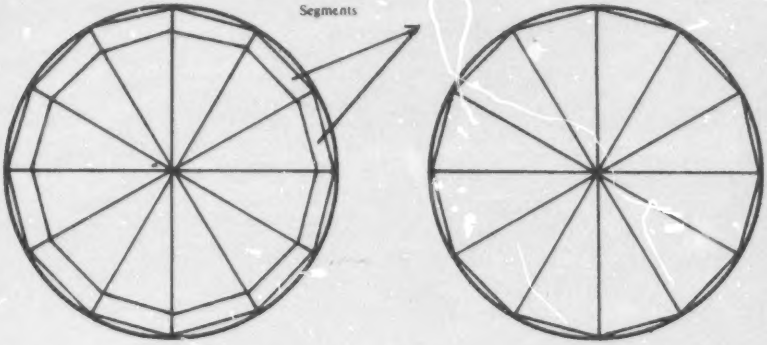


Figure 13. Layout for segment construction.

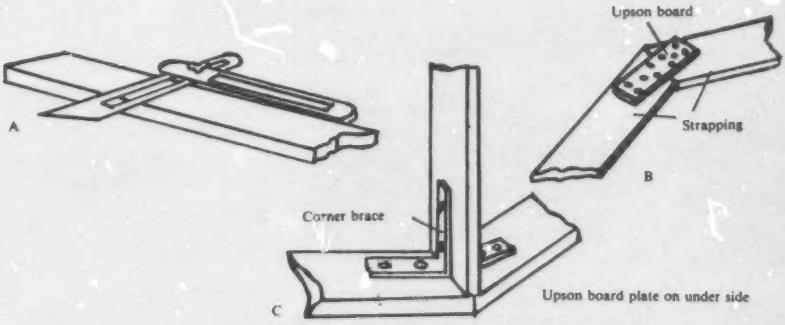


Figure 14. Use of a T bevel to lay out angles, straight gusset plates to connect segments, and corner braces to connect uprights.

b. Burlap can be dyed or purchased in a variety of colors.

c. Unbleached muslin can be sized with a mixture of water and glue and then painted with tempera paint.

3. Hinging Frames Together:

a. Folding screen hinges should be used when it is important for the frame to fold in either direction. Two 1-inch hinges can be used on frames 6 feet in height and smaller.

b. Butt hinges can be used on frames that fold in one direction only. Two 2-inch butt hinges can be used on frames 6 feet in height and smaller. On a folding puppet stage 2-inch butt hinges may be used on one side, but on the opposite side it is suggested that 1-inch folding screen hinges be used. This combination will allow the stage to be folded into a narrow package for easy storage.

4. Dolly Construction: A dolly is a low truck with small wheels and is used to add the element of movement to vehicles made from frame construction. To illustrate, a group of children decide to build a train that can move about the classroom. Wheels could be made for the train, but cutting out circles from heavy stock is very difficult even for a trained craftsman. Children could bring in old cart or carriage wheels, but problems of size and fastening could be insurmountable. It is suggested that a dolly be used when movement is important to any vehicle made from frame construction. Wheels can be made from segment construction to hide the dolly wheels and give the vehicle the appearance of moving about on its own wheels. Here is how to construct a dolly:

a. Cut a piece of ¾-inch plywood to the desired size. A large dolly should be about 2 X 4 feet and a small dolly should be about 1½ X 2 feet.

b. Purchase a set of casters. For the large dolly use four 2-inch casters; for the smaller use three 1-inch casters.

c. Secure the casters to the base of the plywood about one inch from the corners with 5/8-inch, No. 8 flat head wood screws. If only three casters are used, locate the front caster in the center about 3 inches from the front edge of the plywood. The dolly is completed and should roll with little effort.

d. Frames can be secured to the dolly with corner braces.

Materials on Frame Construction taken from Calder and Antan, *Techniques and Activities to Stimulate Verbal Learning:* New York, MacMillan 1970 (out of print).

Another Type II experience can be illustrated by the following example:

The teachers of Cottage Grove School, Coventry, Ohio, wrote and received a grant which involved the study of plants, animals, and weather. The grant provided funds for materials and equipment including a greenhouse. A special area of the school yard was fenced off to provide an area for students to work and study. Students have been involved in planting, pruning and caring for trees and bushes. They have mixed cement,

laid cement stepping stones for a pathway, and painted bench tops. Students from a local vocational school assisted with setting up the greenhouse.

Students are continuously involved in planting seeds and bulbs, taking cuttings and caring for plants. They are also responsible for the plants in the greenhouse. Some students work independently on special planting projects.

Since the start of this experience many other projects emerged. Students have been involved in the economics of buying materials and selling items to earn enough profit to continue the experience. Students also make their own flower pots from clay. These pots were used as planters for their seedlings grown in the greenhouse.

Teachers concluded that the most rewarding aspect of this project was seeing students work together; dependent on each other for a satisfactory conclusion to their experience.

Frame construction is simple enough to be performed by students in grades K-4. The greenhouse, benches and tables for this project could have been constructed using frame construction techniques. This technique also lends itself to the construction of animal cages, a storage shed for tools or forms in which to pour concrete.

Type III Enrichment

A Type III Enrichment activity can be illustrated by expanding the Cottage Grove School project. If a student were interested in construction, architecture or plant sciences, the following activity could be undertaken. The student could design or search out plans for a greenhouse, one that could be built using frame construction.

Information about greenhouses and their construction can be obtained from the following:

1. Hobby Greenhouses
   a) Aluminum Greenhouses, Inc.
      14615 Lorain Avenue
      Cleveland, OH 44111
   b) English Greenhouse , Ltd.
      Turnpike Industrial Park
      Roland Avenue & Church Road
      Mt. Laurel, NJ 08057
   c) Sturdi-built Manufacturing Co.
      11304 S. W. Boones Ferry Road
      Portland, OR 97219
   d) Rough Brothers Greenhouses
      4229 Spring Grove Avenue
      Cincinnati, OH 45223
2. Greenhouse Companies
   a) Ickes-Braun Greenhouse Mfg. Co.
      P. O. Box 147
      Deerfield, IL 60015

b) Lord and Burnham
Irvington-on-Hudson
New York 1053

c) Nexus Corporation
2250 19th Street
Denver, CO 80202

d) Texas Greenhouse Company
2715 St. Louis Avenue
Fort Worth, TX 76110

3. Plans for Greenhouses and Equipment are available from:

College of Agriculture
Cooperative Extension Service
University of Connecticut
Storrs, CT 06268

4. Field trips to:
a) Local greenhouses, both commercial and hobby type
b) Universities or colleges with schools of agriculture
c) State Cooperative Extension Service Centers

Exploring the World of Work
Type I Enrichment: Exploring the World of Work can be accomplished by providing students with an opportunity to investigate fields of interest. This sixth grader is looking through a sophisticated photomicroscope with a mentor who is a research associate for Sohio. Project REACH, Hudson Local School District, Hudson, Ohio.

Type II Enrichment: Students dismantle broken appliances and electronic equipment in order to see "how things work". They save the "innards" of things like digital clocks to observe the mechanisms. McDowell Elementary School, Hudson, Ohio.

Type II Enrichment Experience

Third grade students in a class taught by Mrs. Houenstein, Cottage Grove School, Coventry, Ohio, explored the world of work through a mass production activity. They constructed bird feeders, bird houses and weather equipment using simulated assembly line techniques.

This type of activity requires that teacher and students work together selecting the project(s) to be constructed; planning and designing jigs and fixtures; and determining the various tasks required to construct the project. After selecting the project(s) to be constructed, one group of students designed and built the necessary jigs and fixtures, while another group received and assigned tasks. A third group was responsible for selecting the materials, equipment and supplies necessary to construct the project(s). When all groups completed their assignments, students undertook the task of setting up the assembly line and establishing a flow chart for everyone to follow.

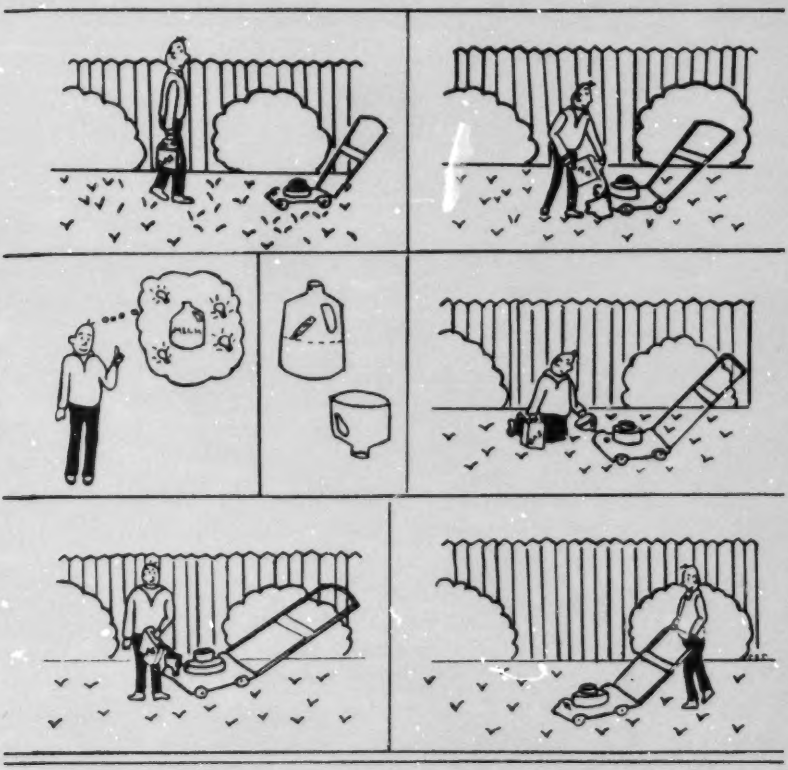
Students took their places on the assembly line working as: assemblers, jig and fixture operators, equipment operators, inspectors, quality controllers, finishers and material handlers. The students and teacher spent time after each production period discussing problems that may have occurred during the manufacturing of an item. These discussions often resulted in the modification of the sequence of operations or of a specific jig.

Finished items were stored and later distributed to participating students. This activity could have been extended to include finished products being sold at an open house or at a local mall by students. This expanded activity could provide students with many additional enrichment experiences.

Handy Household Hints

The wordless illustrations presented below provide students with creative opportunities to express their ideas. These pictures illustrate how knowledge about tools, materials and equipment can be used to solve a variety of common problems. The illustration shows how an ingenious homeowner handles the problem of spilling gasoline when fillng a lawn mower. Similar examples could be developed by students for display in the local or school newspaper. These handy household hints could be compiled into a booklet. Th experience represents an excellent Type III activity because knowledge from the field of industrial arts is necessary for solving this kind of problem.

HANDY HOUSEHOLD HINTS



Printing

Printing is the process of decorating a surface by stamping it with an inked design. Generally, the procedure is to ink a raised surface which bears the design to be printed. The inked design is then pressed against the surface to be imprinted, transferring the design to it. This activity can fulfill the requirements of each phase of the Enrichment-Triad Model.

Type I Enrichment

The wide variety of techniques which can be used in printing gives the child an opportunity to explore different shapes and designs. Furthermore, because printing appeals to inventiveness, it can be used to stimulate students to create designs, cartoon people, animals, and situations using the prints. For example, the free form of a string print spurs the child to be creative. The figures, shapes and designs that are suggested by the prints can encourage both oral and written expression in story or cartoon form.

The process of printing also fosters divergent thinking—the child's ability to vary his thinking in many different directions. This type of thinking requires flexibility, originality, and usually elecits a variety of responses. When a child uses the shapes he has created to form completely new designs, pictures or objects, he demonstrates divergent thinking.

As a Type I activity, printing can be used to introduce the child to different printing techniques, different shapes, and different combinations of shapes. This exploration aids the student in developing oral, written, and visual communication skills.

Type II Enrichment

Once students discover printing techniques which particularly interest them, they may desire to create a more complex group project. Various forms of printing can accommodate this desire. For instance, the class may decide to create a class story using the printing designs of individuals. Class discussions can determine the character or situation which each print will represent. Through class participation, a story can be written and this written text can be combined with the prints to make a storybook.

The following list of resources will be useful to students wishing to learn about different techniques of printing:

Amon, Martha Ruth and Rawson, Ruth Holtz. *Handcrafts Simplified,* Bloomington, Illinois: McKnight and McKnight Publishing Company, 1961.

Hyde, Margaret Oldroyd and Keen, Frances W. *Hobby Fun Book,* Pelham, New York: The Seahorse Press, 1952.

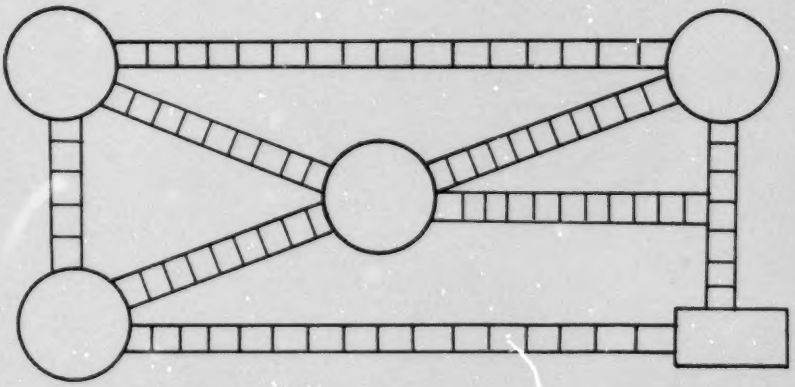
Mattil, Edward L. *Meaning in Crafts,* Englewood Cliffs, New Jersey: Prentice-Hall, Inc. 1959.

Shivers, Hay S. and Calder, Clarence R. *Recreational Crafts: Programming and Instructional Techniques,* New York: McGraw-Hill Book Company, 1974.

Wankelman, Willard F. and Wigg, Philip. *Arts and Crafts* (4th Ed.) Dubuque, Iowa: William C. Brown Publishing Company, 1978.

Another printing activity suitable for group involvement is gameboard construction. Shapes on the board can involve the use of several types of printing including stick, cardboard, leaf and/or block printing. Through class discussions and demonstrations, students can be guided in the development of a board. The following procedures will be useful. The teacher can:

1. Demonstrate how the various techniques can be used in the construction of a game board.
2. Provide an environment in which the children can be creative, use problem solving and decision making opportunities throughout the experience.
3. Introduce new words, writing them on the chalkboard, guiding children to understand their pronunciation, spelling and meaning.
4. Provide the learner with the opportunity to demonstrate the procedure to another individual, after he or she has completed his own board.
5. Develop an experience chart with the learners after the gameboard has been completed.
6. Guide students in all related aural skills development.
7. Guide students in all related visual skills development.
8. Guide students in related social or emotional development.
9. Assist students in establishing safety rules and work procedures



The construction of a gameboard is a task children readily undertake because of its high interest value. The prime objective in its undertaking is to use the constructional process as a vehicle for development of specific skills and understandings.

Type III Enrichment

As a Type III activity, printing can provide the student with an opportunity for individual or small group investigations of problems. The student can experiment and develop new printing techniques. Once the student discovers new techniques these can be used to create a printing book with step-by-step directions on how to use them. The gifted child can then work with LD students using the book as a teaching device.

In addition, printing gameboards can also serve as a Type III activity. However, in this stage the child should be capable of doing more than just printing the board. He or she should create his or her own game with an instruction manual showing the objective and rules of the game. Again the gifted students can work with LD learner to see if the game's directions are clear and easy to follow.

Summary and Conclusions

The information presented in this monograph provides the classroom teacher with some insights into how technological processes inhance learning for the gifted and talented. The purpose of technological activities in the elementary school is to stimulate, enrich, and extend the learning of young children. The area of technology is not a separate subject, but is considered an integral part of the total curriculum.

A broad definition of giftedness includes three clusters of traits necessary for determining giftedness: above average ability, task commitment, and creativity. More specifically, several procedures exist for identifying the gifted in the area of technological process/practices. Because of the scarcity of appropriate evaluation materials, these procedures rely largely on human judgement. Evaluating techniques are discussed, however, which can be used with a high degree of accuracy to identify gifted and talented individuals in this specific area.

The Enrichment-Triad Model was designed to assist in fulfilling two major goals of any gifted program: to provide students with an opportunity to pursue their interests in depth, and to enable the individual student to pursue this interest in his/her own learning style. The three types of enrichment experiences presented in this model are general exploratory activities, group training activities, and individual and small group investigations.

There are many technological process/practices which can be used in each phase of the Enrichment-Triad Model. Examples used in this monograph include solid block construction, frame construction, printing techniques, creative use of materials, tools, and equipment, and exploration of the world of work.

Technology is a manifestation of an individual's intellect as developed by his/her adaptation to and shaping of the environment in which he/she lives. The challenge of contemporary education is to realize and develop avenues that the student can use to explore and comprehend the forces that permeate his/her environment. Elementary students involved in a study of technology can experience "real" possibilities and opportunities to realize and interpret the environment as it is, so that they will be better prepared to shape their environment in the future.

There can be no disputing the fact that today's students are growing up in a technological society. By being exposed to and using materials, tools, equipment, and processes like those suggested in this monograph, students will be more aware of their environment and able to cope with the demands of the society which awaits them.

REFERENCES

Glennon, Vincent J. *Mathematical Education of Exception Children and Youth: An Interdisciplinary Approach.* Reston, Virginia: National Council of Teachers of Mathematics, 1981.

Marland, S.P. *Education of the Gifted and Talented.* Report to the Congress of the United States by the U.S. Commissioner of Education and Background Papers Submitted to the U.S. Office of Education. Washington, D.C.: U.S. Government Printing Office, 1972.

Nicholls, J. C. "Creativity in the Person Who Will Never Produce Anything Original and Useful: The Concept of Creativity as a Normally Distributed Trait." *American Psychologist.* 1972, 27. pp. 717-27.

Renzulli, Joseph S. "What Makes Giftedness?" *Phi Delta Kappan,* November, 1978, 60(3) pp. 180-261.

Renzulli, Joseph S. and Smith, Linda H. "An Alternative Approach to Identifying and Programming for Gifted and Talented Students". *G/C/T,* November/December,1980, 15. pp. 4-11.

Renzulli, Joseph S. and Smith, Linda H. *Developing Defensible Programs for the Gifted and Talented.* Creative Education Foundation, Inc., 1978, 12(1) pp. 21-29.

Ridge, H. Lawrence and Renzulli, Joseph S. "Teaching Mathematics to the Talented and Gifted", *Mathematical Education of Exceptional Children and Youth: An Interdisciplinary Approach* (Ed. Glennon). Reston, Virginia: National Council of Teachers of Mathematics, 1981.

Terman, L. M. et. al. *Genetic Studies of Genius: Mental and Physical Traits of a Thousand Gifted Children.* Standord, California: Stanford University Press, 1926.

Wallach, M. A. "Test Tell Us Little About Talent". *American Scientist,* 1976, 64(1) pp. 57-63.

Witty, P. A. "Who are the Gifted?" in N. B. Henry editor *Education of the Gifted,* Fifty-seventh yearbook of the National Society for the Study of Education, Part 2. Chicago, University of Chicago Press, 1958, p. 62.

The authors would like to thank the following individuals for their willingness to share industrial arts ideas and activities that have been used successfully with gifted students. These examples played a major role in the development of this monograph.

Mrs. Connie Leonard
Greenwood Elementary School
2250 Graybill Rd.
Uniontown, Ohio 44685

Mrs. Kenna Hauenstein
Cottage Grove School
3185 Daisy Ave.
Akron, Ohio 44319

Mrs. Joan Maher
Resource Teacher, REACH
Hudson Local School District
Hudson, Ohio 44236

ORDER FORM

Please send me copies of the following ACESIA publications.*

QUANTITY ORDERED	TITLE OF PUBLICATIONS	UNIT COST	TOTAL COST
	Schools for Children.....	$1.50	
	Problem Solving and Technology.....	$1.50	
	Directory of Resource People.....	$1.50	
	Developmental Growth of Elementary School Students.....	$1.50	
	Implications of Piagetian Theory for Early Childhood I. A.....	$1.50	
	Education of the Handicapped and its Implications for Elementary I. A.	$1.50	
	Establishing an Elementary Industrial Arts Program.....	$1.50	
	Safety for Elementary School Technological Activities.....	$2.50	
	Technology: the Gifted Student in the Elementary School.....	$1.50	
	Total Amount Enclosed		

** Please make checks payable to: ACESIA*

Mail Order Form to:

Dr. William A. Downs
ACESIA Publications Chairperson
Central Missouri State University
Warrensburg, MO 64093
816-429-4727

(Please allow two (2) weeks for processing and delivery)

EVALUATION

The title of the ACESIA publication being evaluated is:

_____

This is a very useful monograph.....YES ( ) NO ( )

If you checked YES, what did you like about the monograph? _____

_____

_____

If you checked NO, what did you not like about the monograph? _____

_____

_____

The articles were well written.....YES ( ) NO ( )

The articles were very timely.....YES ( ) NO ( )

I would recommend that a monograph be developed and the following topic(s):

A. _____

_____

_____

B. _____

_____

_____

Evaluator: _____

Level of Practice: _____

Address: _____

_____

_____

_____

Please return this evaluation form to the ACESIA Publications Chairman who's address appears at the bottom of the following page.

BEST COPY AVAILABLE

ACESIA OFFICERS

President
Dr. E. Keith Blankenbaker
Ohio State University
190 W. 19th Avenue
Columbus, OH 43210
614-422-2661 (O)

Vice-President for Programs
Dr. Roger Schaefer
District 1 Technical Institute
620 W. Clairmont Avenue
Eau Claire, WS 54701
715-836-4877 (O)

Vice-President for Representatives
Dr. John H. Lucy
Industrial Arts Department
California State University
California, PA 15419
412-938-4381 (O)

Circulation Manager
Dr. William A. Downs
G108B, Central Missouri State University
Warrensburg, MO 64093
816-429-4727

Secretary
Mrs. Beverly Minton
8699 Acorn Avenue
Milan, MI 48160
313-434-1961 (H)

Treasurer
Dr. Karen Zuga
Kent State University
Industrial Arts Education
Kent, OH 44242
216-672-2892 (O)

Past President
Dr. F. Milton Miller
University of Missouri-Columbia
103 Industrial Education
Columbia,MO 65211
314-882-3082 (O)

COMMITTEE CHAIRPERSONS

Budget
Dr. Robert Thrower
Industrial Education and Technology
Trenton State College
Trenton, NJ 08625
609-711-2529

Constitution
Mr. James F. Snyder
State Department of Education
Capitol Complex B-330
Charleston, WV 25305
304-348-7805

Educational Exhibits
Mr. Wib Namestka
Los Angeles Unified School District
450 N. Grant Avenue
Los Angeles, CA 90051
213-661-0845

Membership
Dr. Gary Schreiner
Dept. of Technology and Education
Southeast Missouri State University
Cape Girardeau, MO 63701
314-651-2104

Research
Dr. Richard Dahl
San Francisco State University
1600 Holloway Avenue
San Francisco, CA 94132

Newsletter
Dr. Terry Leeper
Dept. of Ind. and Eng. Tech.
Western Kentucky University
Bowling Green, KY 42101
505-745-3251

Plan of Action and Recognition
Dr. F. Milton Miller
University of Missouri-Colombia
103 Industrial Education
Columbia, MO 65211
314-882-3082

Publications
Dr. Clarence R. Calder
University of Connecticut
U-33 School of Education
Storrs, CT 06268
203-486-2429

Publicity
Dr. Mark Estepp
Wallace Hall
Livingston University
Livingston, AL 35470
205-652-9661